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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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STAAS & HALSEY LLP SUITE 700 1201 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005			EXAMINER OLSEN, LIN B	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/809,351

Applicant(s)

KIM ET AL.

Examiner

Lin B. Olsen

Art Unit

3661

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 August 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 10-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 2 is/are allowed.
- 6) ☐ Claim(s) 1,3,5-7,10-12,14-21,23 and 24 is/are rejected.
- 7) ☐ Claim(s) 4,8,13 and 22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the Amendment and Remarks filed August 30, 2007, in which claims 1-8 and 1-24 were presented for Examination.

Response to Amendments

Specification

The replacement paragraph for paragraph 28 on page 4 has been entered.

The text of replacement paragraph is objected to because the text for Figs 6B and 7B is incorrect. Fig. 6B illustrates a single-sided mirror rotating at phase angles, rather than a transmitter rotating as is currently stated in the text. Fig. 7B illustrates that a double-sided mirror rotates, not a transmitter rotating as currently stated in the text. Correction is required.

The paragraph inserted following paragraph 56 on page 9 has been entered.

The text of the paragraph inserted following paragraph 56 is objected to because Figs. 6B and 7B do not show a transmitter rotating as the text states, but rather a mirror rotating. Correction is required.

Claim Objections

The objection to the claims is withdrawn.

Claim Rejections - 35 USC § 112

The rejection of claims 14 under 35 U.S.C. 112 2nd paragraph is withdrawn.

Claim 13 is rejected under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In line 14 of the amended claim, the claim recites "the at least one mirror". There is insufficient antecedent basis for the limitation in the claim.

Response to Arguments

Applicants arguments filed August 30, 2007 have been fully considered but they are not persuasive. Regarding claims unpatentable over Halsall et al., Applicant contends the applied reference does not discuss or suggest that a rotation driving part of the beacon outputs information on a phase shift of a transmitting part of the beacon relative to a reference direction of the rotation driving part of the beacon in accordance with the rotation of the rotation driving part. The Examiner disagrees; Halsall's rotation driving part includes A Clock pulse generator, an n bit Gray code counter, a gray code comparator, a Motor drive control, a Stepping motor and a Beacon gray code disc (Items 37, 36, 35, 34, 31 and 32 of Fig. 3). This rotation driving part outputs information on a phase shift (line from item 32 to item 33 in Fig. 3) of a transmitting part of the beacon (item 29 of Fig. 3) relative to a reference direction (a selected datum direction) of the rotation driving part in accordance with the rotation of the rotation driving part. The direction of the transmitting part (29) is continually compared to a reference rotation standard (36) to assure they are in phase. As stated at col. 7, lines 39-42 "The output of the modulator 33 is fed to the light source 29 to provide coded-data corresponding to ... the direction of the beam of light emitted therefrom."

Applicant contends that Halsall does not discuss or suggest that the rotation driving part itself outputs information on a phase shift of the transmitting part relative to a reference direction of the rotation driving part. The Examiner disagrees; The rotation driving part outputs the gray code from the beacon gray code disc to the light source modulator to control the phase shift encoded in the light from the light source 29. At col. 1, lines 60 – 65, frequency modulation and/or pulse-coded modulation are suggested ways on incorporating the phase shift information. While the applicant contends that the phase shift information is unique to each beacon, claims 1, 16 and 19 each relate the phase shift to the transmitting part in accordance with the rotation of the rotation driving part. Since all beacons in Halsall are synchronized, the reference direction of each beacon (its datum direction) is true to its rotation driving part and the same as that of each other beacon.

Applicant's arguments with respect to the rejection(s) of claim(s) 3, 8, 12 and 21 under U.S.C. 103 as unpatentable over Price et al. in view of Bischoff have been fully considered and are persuasive. Therefore, the rejection to these claims has been withdrawn.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 5, 7, 10-11, 15-20, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Halsall et al. U. S. Patent No. 4,309,758 (hereafter referenced as Halsall).

Halsall discloses an autonomous vehicle (a robot) that is guided using light sensitive detectors that respond to light transmitted by fixed beacons that transmit beacon indicia and coded information concerning the direction of the beam with respect to a fixed axis (col. 1 lines 14-31, lines 44-47). The beam rotates about a vertical axis and the character of the rotating beam is changed such as by frequency modulation or time base of pulsation as the beam sweeps around the axis (col.1 lines 60-65) and thereby traverses a circle of compass points.

In Halsall, a specific form of phase encoding is described. This encoding uses a gray code to specify the unique pattern of binary bits used to provide coded data corresponding to the location of the beacon and the direction of the beam of light emitted therefrom. (col. 7, lines 27 to col. 8, line 3). The coding is carried in pulse modulated form (col. 2, lines 49-56). This corresponds to applicant's phase encoding by "PWM (pulse width modulation)".

Regarding independent **claims 1 and 19**, A robot system including a beacon with a transmitting part to transmit light - Halsall discloses a collimated light source 29, "a beacon", - to determine location, and a mobile robot with a receiving part to receive the light,

the beacon comprising:

a rotation driving part to rotate the transmitting part - mechanical couplings 30 to a stepping motor 31-; and

an encoder - A light source modulator 33- to add phase information regarding rotation of the transmitting part to the light - The output of modulator 33 is fed to the light source 29, and

the mobile robot - col. 1 lines 14-30 a roving automatic vehicle "a robot"- comprising:

a location determiner - a computer capable of interpreting the information from the detectors relating to the position of each fixed station to determine the location of the automatic vehicle, col. 1 lines 47-52-to determine a location of the mobile robot based on the phase information of the light received by the receiving part - on-board light sensitive detector(s),

wherein the rotation driving part - Halsall's rotation driving part includes A Clock pulse generator, an n bit Gray code counter, a gray code comparator, a Motor drive control, a Stepping motor and a Beacon gray code disc (Items 37, 36, 35, 34, 31 and 32 of Fig. 3).- outputs information on a phase shift of the transmitting part - (line from item 32 to item 33 in Fig. 3) - relative to a reference direction - (a selected datum direction) -of the rotation driving part of the beacon in accordance with the rotation of the rotation driving part - The direction of the transmitting part (29) is continually compared to a reference rotation standard (36) to assure they are in phase. As stated at col. 7, lines 39-42 "The output of the modulator 33 is fed to the light source 29 to provide coded-data corresponding to ... the direction of the beam of light emitted therefrom."

Regarding **claim 5**, which is dependent on claim 1, wherein the receiving part further comprising: at least one receiver to receive the light transmitted from the transmitting part - figure 1 illustrates three receivers 12 on the vehicle.

Regarding **claim 7**, which is dependent on claim 1, wherein the beacon has inherent beacon information, and the encoder adds the beacon information and the phase information to the light - figure 3 and col. 7 lines 27-42 disclose preset map reference information fed into the light source modulator 33. The light source modulator 33 incorporates the gray code angular direction information and present map reference information onto the signal that modulates the rotating light source by means such as frequency modulation

Regarding **claim 10**, which is dependent on claim 1, wherein the robot system further comprises: a plurality of beacons - Figure 3 illustrates that other light beacons (Nos. 2, 3, 4 etc.) can be utilized.

Regarding **claim 11**, which is dependent on claim 10, wherein the beacons have beacon information and the encoder encodes or modulates the beacon information of the plurality of beacons with the phase information to the light - Figure 3 illustrates that each beacon incorporates a light source modulator 33 that combines beacon identification (shown incoming from outside the figure and called - pre-set map

reference) with the annular direction of the light (as encoded by the gray code disc 32, the line labeled - position feedback)..

Regarding **claim 15**, which is dependent on claim 10, wherein each of the plurality of beacons have different inherent beacon information - figure 3 illustrates that each modulator receives a pre-set map reference of its beacon.

Regarding **claims 16-18**, Independent **claim 16** differs from rejected claim 1 primarily in its recital of "a plurality of beacons". Halsall discloses at col. 1, lines 53-59, using a plurality of stations each identifying themselves to the detectors of the vehicle. In col. 1, lines 44-47, Halsall discloses that each station emits light that carries its own message concerning the direction of its beam with respect to a fixed axis. The fact that Halsall's beacons are synchronized in phase does not nullify the fact that each of the beacons outputs light containing information of the direction of the beam with respect to a fixed axis. The phase information regarding rotation of the light is added by the light source modulator 33 that combines beacon identification with the annular direction of the light (as encoded by the gray code disc 32, the line labeled - position feedback

Regarding **claims 17 and 18**, in col. 1 lines 55 to 57 and col. 2 lines 43-48, Halsall discloses that when there are a plurality of stations, each identifies itself to the detectors. This reads on "each of the plurality of beacons has different inherent beacon information." Further Halsall discloses that the vehicle can distinguish between the light

from different stations, which reads on "the mobile robot determines the source of received phase information, and calculates a location on the mobile robot."

Regarding **claim 20**, which is dependent on claim 19, wherein the transmitting part further comprising: at least one transmitter rotated by the rotation driving part – In Fig. 3, the rotating collimated light source 29 is rotated via the coupling shaft by the motor drive control 34,.

Regarding **claim 23**, which is dependent on claim 19, wherein the transmitting part has inherent information, and the encoder adds the beacon information and the phase information to the light - figure 3 shows the light source modulator 33 adding the pre-set map reference for beacon 1 and the gray code disc output 32 to the rotating light source 29.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 6 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halsall in view of Rocks U.S. Patent No. 5,974,348 (hereafter referenced as Rocks). Rocks, like Halsall is directed to of self-propelled autonomous robots determining their location. Halsall teaches that the error is minimized when the detectors receive light simultaneously.

Regarding **claim 6**, while Halsall, as discussed above, discloses a roving automatic vehicle guided by on-board light sensitive detectors, it does not show "the receiving part further comprising: a conical mirror to reflect light from various directions towards one direction; and a receiver to receive the light reflected from the conical mirror". Rocks at col. 9., lines 35-40 discloses using a panoramic image collector 210 which may be a conical reflector, which reads on "conical mirror to reflect light from various directions towards one direction" to reflect light beams from the beacons to an imaging camera 324, which reads on "a receiver to receive the light reflected from the conical mirror". It would have been obvious to one of ordinary skill in the art at the time of the invention to add the conical mirror to Halsall's receivers to increase the simultaneity of the received light.

Regarding **claim 14**, Halsall does not show "a conical mirror to concentrate light transmitted". Rocks at col. 9, lines 35-40 discloses using a panoramic image collector 210 which may be a conical reflector to reflect light beams from the beacons. Further in figure 6A, Rocks shows the light from all directions being directed through a common point 630. This reads on "a conical mirror to concentrate light transmitted". It would have been obvious to one of ordinary skill in the art at the time of the invention to add the conical mirror to Halsall's receivers to increase the simultaneity of the received light.

Claims 3, 12, 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halsall in view of Price. Price is directed toward a navigation system

that uses encoded light as a beacon. Price is specific on beacon construction while Halsall specifies the functionality of a beacon.

Regarding **claims 3, 12 and 24**, which are dependent on claim 1, wherein the transmitting part further comprising: -

- a mirror disposed at an incline with respect to a horizontal direction; and
- a transmitter to emit the light at a predetermined incident angle;

wherein: the rotation driving part rotates the mirror, and the encoder adds the phase information regarding rotation of the mirror to the light. – Halsall does not specify the transmitting mechanics beyond specifying that it is rotated by the rotating part. Price specifies a mechanics for a transmitting part. It would have been obvious to one of ordinary skill in the art at the time of the invention to rotate Price's transmitter of Halsall's mast to minimize the problem of rotating a transmitter. Price in Fig. 2 shows an inclined mirror 22 receiving the light from an encoder 19 and rotating the base that holds the mirror.

Regarding **claim 21**, which is dependent on claim 19, wherein the transmitting part further comprising:

- a mirror disposed at an incline with respect to a horizontal direction; - Item 22 of Price Fig. 2

- a transmitter to emit the light at a predetermined incident angle; - the assembly of Price Fig. 2

wherein the rotation driving part rotates the mirror; and – Halsall Fig. 3- items 37, 36, 35, 34, 31 and 32

the encoder adds the phase information regarding rotation of the mirror to the light. – Halsall Fig. 3, items 32 and 33.

Allowable Subject Matter

Claim 2 is allowed

The following is an examiner's statement of reasons for allowance:

Claim 2 recites more than one transmitter rotated by the rotation driving part, and sending light encoded with phase information regarding the rotation; the transmitters spaced apart from each other. This combination was not taught or suggested by the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claims 4, 8 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 13 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

The following is a statement of reasons for the indication of allowable subject matter:

Claim 4, 13 and 22 recite that the transmitting part emits light toward the double sides of the mirror in the beacon. Use of a double-sided mirror was not taught or suggested in the prior art.

Claim 8 recites that the location determiner bases the locations determination on the combination of the phase information from the transmitting part and displacement of the mobile robot.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lin B. Olsen whose telephone number is 571-272-9754. The examiner can normally be reached on Mon - Fri, 8:30 -5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas G. Black can be reached on 571-272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LO


THOMAS BLACK
SUPERVISORY PATENT EXAMINER